CLAIMS

1. A magnetic head assembly, that has a head surface for facing a magnetic medium, comprising:

a read head that includes a sensor;

the sensor including:

an antiparallel (AP) pinned layer structure;

a ferromagnetic free layer structure having a magnetic moment that is free to rotate in response to a field signal; and

a spacer layer located between the free layer and the AP pinned layer structure;

the antiparallel (AP) pinned layer structure including:

ferromagnetic first and second antiparallel (AP) pinned layers;

an antiparallel coupling (APC) layer located between and interfacing the first and second AP pinned layers;

the first and second AP pinned layers self pinning one another without assistance of an antiferromagnetic (AFM) pinning layer;

the second AP pinned layer being located between the first AP pinned layer and the spacer layer; and

the first AP pinned layer being composed of cobalt platinum chromium.

2. A magnetic head assembly as claimed in claim 1 including:

nonmagnetic electrically nonconductive first and second read gap layers;

the sensor being located between the first and second read gap layers;

ferromagnetic first and second shield layers; and

the first and second read gap layers being located between the first and second shield layers.

3. A magnetic head assembly as claimed in claim 2 further comprising:

a write head including:

ferromagnetic first and second pole piece layers that have a yoke portion located between a pole tip portion and a back gap portion;

a nonmagnetic write gap layer located between the pole tip portions of the first and second pole piece layers;

an insulation stack with at least one coil layer embedded therein located between the yoke portions of the first and second pole piece layers; and

the first and second pole piece layers being connected at their back gap portions.

4. A magnetic head assembly as claimed in claim 2 wherein the free layer is located between the AP pinned layer structure and the first pole piece layer.

5. A magnetic head assembly as claimed in claim 2 wherein the cobalt platinum chromium is $Co_{82}Pt_{10}Cr_8$.

6. A magnetic head assembly as claimed in claim 5 wherein the second AP pinned layer is composed of cobalt iron (CoFe).

7. A magnetic head assembly as claimed in claim 6 further comprising:

a seed layer structure located between the first read gap layer and the AP pinned layer structure; and

the seed layer structure including:

a first seed layer composed of tantalum (Ta) and a second seed layer composed of nickel iron chromium (NiFeCr); and

the first seed layer being located between the first read gap layer and the second seed layer.

8. A magnetic head assembly as claimed in claim 7 wherein the free layer structure includes a first free layer composed of cobalt iron (CoFe) and a second free layer composed of nickel iron (NiFe) with the first free layer being located between the spacer layer and the second free layer.

9. A magnetic head assembly as claimed in claim 8 wherein the spacer layer is copper (Cu).

10. A magnetic disk drive including at least one magnetic head assembly that has a head surface for facing a magnetic medium and that includes a write head and a read head, comprising:

the write head including:

ferromagnetic first and second pole piece layers that have a yoke portion located between a pole tip portion and a back gap portion;

a nonmagnetic write gap layer located between the pole tip portions of the first and second pole piece layers;

an insulation stack with at least one coil layer embedded therein located between the yoke portions of the first and second pole piece layers; and

the first and second pole piece layers being connected at their back gap portions;

the read head including:

nonmagnetic electrically nonconductive first and second read gap layers;

a sensor located between the first and second read gap layers;

ferromagnetic first and second shield layers; and

the first and second read gap layers being located between the first and second shield layers;

the sensor including:

an antiparallel (AP) pinned layer structure;

a ferromagnetic free layer structure having a magnetic moment that is free to rotate in response to a field signal; and

a spacer layer located between the free layer structure and the AP pinned layer structure;

the antiparallel (AP) pinned layer structure including:

ferromagnetic first and second antiparallel (AP) pinned layers;

an antiparallel coupling (APC) layer located between and interfacing the first and second AP pinned layers;

the first and second AP pinned layers self pinning one another without assistance of an antiferromagnetic (AFM) pinning layer;

the second AP pinned layer being located between the first AP pinned layer and the spacer layer; and

the first AP pinned layer being composed of cobalt platinum chromium;

a housing;

the magnetic medium being supported in the housing;

a support mounted in the housing for supporting the magnetic head assembly with said head surface facing the magnetic medium so that the magnetic head assembly is in a transducing relationship with the magnetic medium;

a motor for moving the magnetic medium; and

a processor connected to the magnetic head assembly and to the motor for exchanging signals with the magnetic head assembly and for controlling movement of the magnetic medium.

11. A magnetic disk drive as claimed in claim 10 wherein the cobalt platinum chromium is $Co_{82}Pt_{10}Cr_8$.

12. A magnetic disk drive as claimed in claim 11 wherein the second AP pinned layer is composed of cobalt iron (CoFe).

13. A magnetic disk drive as claimed in claim 12 further comprising:

a seed layer structure located between the first read gap layer and the AP pinned layer structure; and

the seed layer structure including:

a first seed layer composed of tantalum (Ta) and a second seed layer composed of nickel iron chromium (NiFeCr); and

the first seed layer being located between the first read gap layer and the second seed layer.

14. A magnetic disk drive as claimed in claim 13 wherein the free layer structure includes a first free layer composed of cobalt iron (CoFe) and a second free layer composed of nickel iron (NiFe) with the first free layer being located between the spacer layer and the second free layer.

15. A magnetic disk drive as claimed in claim 14 wherein the spacer layer is copper (Cu).

16. A method of making a magnetic head assembly, which has a head surface for facing a magnetic medium, comprising the steps of:

forming a read head that includes a sensor;

a making of the sensor including the steps of:

forming an antiparallel (AP) pinned layer structure;

forming a ferromagnetic free layer that has a magnetic moment that is free to rotate in response to a field signal; and

forming a nonmagnetic electrically conductive spacer layer between the free layer and the AP pinned layer structure;

the forming of the antiparallel (AP) pinned layer structure including the steps of:

forming ferromagnetic first and second antiparallel (AP) pinned layers;

forming an antiparallel coupling (APC) layer between and interfacing the first and second AP pinned layers;

the first and second AP pinned layers being further formed to self pin one another without assistance of an antiferromagnetic (AFM) pinning layer;

forming the second AP pinned layer between the first AP pinned layer and the spacer layer; and

forming the first AP pinned layer of cobalt platinum chromium.

17. A method of making a magnetic head assembly as claimed in claim 16 further comprising the steps of:

forming nonmagnetic electrically nonconductive first and second read gap layers;

forming the sensor between the first and second read gap layers;

forming ferromagnetic first and second shield layers; and

forming the first and second read gap layers between the first and second shield layers.

18. A method of making a magnetic head assembly as claimed in claim 16 wherein the free layer is formed between the AP pinned layer structure and the first pole piece layer.

19. A method of making a magnetic head assembly as claimed in claim 16 wherein the cobalt platinum chromium is $Co_{82}Pt_{10}Cr_8$.

20. A method of making a magnetic head assembly as claimed in claim 19 wherein the second AP pinned layer is formed of cobalt iron (CoFe).

21. A method of making a magnetic head assembly as claimed in claim 20 further comprising the steps of:

forming a seed layer structure between the first read gap layer and the AP pinned layer structure; and

a making of the seed layer structure including the steps of:

forming a first seed layer composed of tantalum (Ta) and a second seed layer composed of nickel iron chromium (NiFeCr); and

forming the first seed layer between the first read gap layer and the second seed layer.

22. A method of making a magnetic head assembly as claimed in claim 21 wherein the free layer structure includes a first free layer formed of cobalt iron (CoFe) and a second free layer formed of nickel iron (NiFe) with the first free layer being located between the spacer layer and the second free layer.

23. A method of making a magnetic head assembly as claimed in claim 22 wherein the spacer layer is formed of copper (Cu).